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| 10/726,232 | 12/01/2003 | Brian H. Moeckly | 844,004-303 | 3720 |

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| EXAMINER | |
|---|---|
| VIJAYAKUMAR, KALLAMBELLA M | |
| **ART UNIT** | **PAPER NUMBER** |
| 1751 | |

DATE MAILED: 10/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/726,232 | MOECKLY ET AL. | |
| | Examiner | Art Unit | |
| | Kallambella Vijayakumar | 1751 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *01 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12, 14-23 and 25-29* is/are rejected.

7)☒ Claim(s) *13 and 24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

- Claims 1-29 are currently pending with the application.
- The examiner has considered the IDS filed 12/1/2003 and 04/05/2004.

### *Claim Rejections - 35 USC § 102*

### *Claim Rejections - 35 USC § 103*

- The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

- The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 6 and 25 are rejected under 35 U.S.C. 102(a/e) as anticipated by Finnemore et al (US 6,514,557).

Finnemore et al teach a superconducting tape, wire and film (C-2, Ln-1) that are identical to that claimed by the applicants, and when the reference teaches a product that appears to be the same as the product set forth in a product-by-process claim although produced by a different process, the claim is not patentable. See In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) And In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP §2113. All the limitations of the instant claims are met.

The reference is anticipatory.

2. Claims 6 and 25 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Saito (US 6,835,696).

Saito et al teach a superconducting MgB2 film formed over a substrate that is identical to that claimed by the applicants (Title, C-4, Ln 15-16), and when the reference teaches a product that appears to be the same as the product set forth in a product-by-process claim although produced by a different process, the claim is not patentable. See In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) And In re

Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP §2113. All the limitations of the instant claims are met.

The reference is anticipatory.

In the alternative that the disclosure by Saito et al be insufficient to arrive at the limitations of the instant claims it would be obvious to a person of ordinary skilled in the art to optimize the process conditions as a choice of design to arrive at a monocrystalline or amorphous superconducting film with reasonable expectation of success because the prior art is suggestive of it (C-6, Ln 31-38).

3. Claims 1-5, 7-12 and 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (US 6,835,696).

Saito et al teach a method of forming as-grown superconducting MgB2 films over a substrate in a carrousel apparatus equipped with a Mg-target, B-target, Al-Target, heated sample/substrate, associated vacuum and monitoring systems, and a platform for supporting the carrousel (Abstract; Fig-1, Cl-2, Ln 58-Cl-3, Ln 10). The process was carried out by ejecting Mg and B from their targets by simultaneously by sputtering forming the MgB2 film without annealing in the reaction room (Cl-2, Ln 1-10). The substrates included MgO and Al2O3 that were heated to a temperature of 250-400C and the substrates were rotated at speed of 50 rpm. The reaction was carried out at a pressure of 2-5 millitorr and for a period of 10-60 mins (C-3, Ln 61 – C-4, Ln 21). Moving of the substrate back into reaction/deposition zone would be obvious over rotating carrousel. The prior art further teaches forming the films in a static type apparatus (C-5, Ln 60-61).

The prior art fails to teach depositing boron on a substrate and then exposing the boron to magnesium vapor per the claim-1.

However, prior art teaches sputter depositing boron and magnesium on a substrate forming MgB2, and the selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results; In re Gibson, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) <MPEP 2144.04>. This further meets the limitations of claims 26-28.

With regard to claim-2, the prior art teaches the rotation of the flat surface of the substrate along an axis in the carrousel.

With regard to claims 3 and 11, the prior art teaches rotating the substrate and varying the reaction pressure in millitorr range which are known variables. Generally, differences in concentration, pressure rotation or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration, pressure rotation or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

With regard claims 4-5 , the prior teaches a substrate of Al2O3 and MgO heated to 250-450C.

With regard to claim-7, the prior art teaches a RF sputter ejection of Mg from a Mg target forming its plume but silent about using other modes of vaporizing the target. The resistive heating of a target generating vapor/plume in forming a sputter thin film is well known in the art (See Face et al US 5,389,606, Cl-7, Ln 34-40; Zeng et al USA 6,797,3471, C-2, Ln 31-41, 51-55) and it would be obvious to a person of ordinary skilled in the art to substitute the RF with a resistance heating method of vaporization in the process as functional equivalent with reasonable expectation of success .

The substrate containing a layer of MgO meets the limitation of a wafer in claim-8.

With regard to claim-9, the prior is silent about nature of the substrate being a tape i.e. a rectangular substrate, and use of rectangular substrate in coating the film would be obvious to a person of ordinary skilled in the art over the teachings of Zheng forming a tape by depositing a thin film of MgB2 superconductor on a substrate in a static apparatus (US 6,797,341; Cl-1, Ln 17-18).

With regard to claims-10 and 12, the prior art teaches multiple substrate holders and processing of plurality of substrates coating the boride superconductor over at least one face would be obvious.

4. Claims 14-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (US 6,835,696) in view of Shimakage et al (US 6,929,820).

Saito et al teach a method of forming as-grown superconducting MgB2 films over a substrate in a carrousel apparatus equipped with a Mg-target, B-target, Al-Target, heated sample/substrate, associated vacuum and monitoring systems, and a platform for supporting the carrousel (Abstract; Fig-1, Cl-2, Ln 58-Cl-3, Ln 10). The process was carried out by ejecting Mg <evaporation cell> and B from their targets by simultaneous sputtering forming the MgB2 film without annealing in the reaction room (Cl-2, Ln 1-10). The substrates included MgO and Al2O3 that were heated to a temperature of 250-400C and the substrates were rotated at speed of 50 rpm. The reaction was carried out at a pressure of 2-5 millitorr and for a period of 10-60 mins (C-3, Ln 61 – C-4, Ln 21). Moving of the substrate back into reaction/deposition zone would be obvious over rotating carrousel. The prior art further teaches forming the films in a static type apparatus (C-5, Ln 60-61).

The prior art fails to teach using an electron beam gun for evaporating boron on to a substrate or a distinctly separate deposition zone per the claim-14.

Although, a distinctly separate deposition zone is not taught by the prior art, it shows a continuous reaction in a reaction room and evaporation zones for Mg and B, and a mere fact that a given structure is integral does not preclude its consisting of various elements, and meets the limitation of apparatus claimed to carry out the deposition process. In re. Howard, 168 USPQ 177,179 (PTO Bd of Int. 1969).

In the analogous art, Shimakage teaches forming MgB2 films by evaporating Boron with electron beam (Abstract/Fig-1).

It would be obvious to a person of ordinary skilled in the art to substitute the RF sputtering for B in the process of Saito et al with electron beam vaporization of Shimakage et al as functional equivalent with reasonable expectation of success.

With regard claims 15 and 18 , the prior teaches a substrate of Al2O3 and MgO heated to 250-450C.

With regard to claim-16, the prior art teaches a RF sputter ejection of Mg from a Mg target forming its plume but silent about using other modes of vaporizing the target. The resistive heating of a target generating vapor/plume in forming a sputter thin film is well known in the art (See Bunshah et al US 5,494,558, Cl-2, Ln 35-37; Zeng et al USA 6,797,3471, C-2, Ln 31-41, 51-55) and it would be obvious to a person of ordinary skilled in the art to substitute the RF with a resistance heating method of vaporization

in the process as functional equivalent and further optimize the temperature for vaporizing Mg with reasonable expectation of success.

With regard to claims 17 and 22, the prior art teaches rotating the substrate and varying the reaction pressure in millitorr range which are known variables. Generally, differences in concentration, pressure rotation or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration, pressure rotation or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

The substrate containing a layer of MgO meets the limitation of a wafer in claim-19.

With regard to claim-20, the prior is silent about nature of the substrate being a tape i.e. a rectangular substrate, and use of rectangular substrate in coating the film would be obvious to a person of ordinary skilled in the art over the teachings of Zheng forming a tape by depositing a thin film of MgB2 superconductor on a substrate in a static apparatus (US 6,797,341; Cl-1, Ln 17-18).

With regard to claims-21 and 23, the prior art teaches multiple substrate holders and processing of plurality of substrates coating the boride superconductor over at least one face would be obvious.

5. Claims 26-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Bozovic et al (US 2001/0036214).

Bozovic et al teach depositing the components of an oxide superconductor by PLD (Laser heating of the elements), depositing over a substrate, moving the substrate to a reaction zone forming a precursor, repeating cycle and then annealing under high Tl or Hg pressure forming the Tl or Hg-superconductor in a layer by layer basis (Abstract, Fig-1, Para 0046). All the limitations of the instant claims are met.

The reference is anticipatory.

***Allowable Subject Matter***

Claims 13 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art of record neither teaches nor fairly suggestive of a method of forming MgB2 films on two sides of a substrate and turning the substrate over and recoating the substrate with MgB2 films.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kallambella Vijayakumar whose telephone number is 571-272-1324. The examiner can normally be reached on 8.30-6.00 Mon-Thu, 8.30-5.00 Alt Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas McGinty can be reached on 571-272-1029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KMV
September 30, 2006.

Mark Kopec
Primary Examiner